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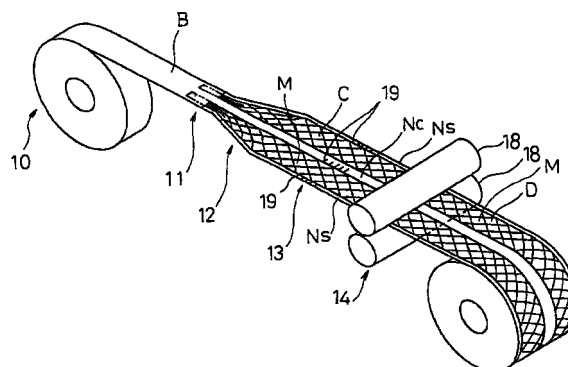
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(54) **Method and apparatus for manufacturing expanded mesh sheet and battery using this expanded mesh sheet**

(57) Fine slits are formed in the metal sheet (B) at the slit forming section (11) by plate cutters (15), excluding portions in the center and on both sides in a width-wise direction of the metal sheet (B), after which the areas where the slits have been formed are drawn out at the expanding section (12) thereby opening the slits and obtaining a mesh sheet (C) which has solid portions in the central portion and on both sides. This mesh sheet (C) is flattened at the rolling section (14) to obtain an expanded mesh sheet (D). An electrode sheet is prepared by applying an active material onto the portions of the expanded mesh sheet (D) where the mesh has been formed, and collectors (1a, 2a) for a battery are cut out from this electrode sheet such that lead connecting portions (1c, 2c) thereof are located at the solid portion of the mesh sheet where there is no openings, with which a positive and negative electrode plates (1, 2) for the battery are manufactured.

*Fig. 1*



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# EUROPEAN SEARCH REPORT

Application Number  
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	GB 2 071 530 A (CHLORIDE GROUP LTD) 23 September 1981 (1981-09-23)	1,3,12	B21D31/04
Y	* the whole document *	2,13	
Y	US 4 291 443 A (LAURIE GORDON H ET AL) 29 September 1981 (1981-09-29)	2,13	
A	WO 90 06000 A (MIXON INC) 31 May 1990 (1990-05-31)	8	
A	EP 0 435 266 A (MATSUSHITA ELECTRIC IND CO LTD) 3 July 1991 (1991-07-03)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B21D H04M
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>13 June 2000</b>	Examiner <b>Peeters, L</b>
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  &amp; : member of the same patent family, corresponding document</p>			

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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13-06-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2071530 A	23-09-1981	DE 3106384 A	21-01-1982
US 4291443 A	29-09-1981	CA 1114241 A	15-12-1981
		AR 219835 A	15-09-1980
		AU 532407 B	29-09-1983
		AU 5224079 A	08-05-1980
		BE 879720 A	15-02-1980
		BR 7907094 A	26-08-1980
		DE 2943765 A	14-05-1980
		DK 459079 A,B,	01-05-1980
		ES 485539 A	16-04-1980
		FR 2440232 A	30-05-1980
		GB 2034610 A,B	11-06-1980
		IT 1124854 B	14-05-1986
		JP 1307568 C	13-03-1986
		JP 55061332 A	09-05-1980
		JP 60029573 B	11-07-1985
		KR 8401715 B	17-10-1984
		NL 7907956 A,B,	02-05-1980
		SE 436546 B	07-01-1985
		SE 7908950 A	01-05-1980
		US 4315356 A	16-02-1982
WO 9006000 A	31-05-1990	NONE	
EP 0435266 A	03-07-1991	JP 2568285 B	25-12-1996
		JP 3204126 A	05-09-1991
		CA 2033422 A,C	29-06-1991
		DE 69008503 D	01-06-1994
		DE 69008503 T	01-12-1994
		KR 9505900 B	02-06-1995
		US 5136765 A	11-08-1992
		US 5239735 A	31-08-1993